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EXAMINER	
CRAIG, DWIN M	
ART UNIT	PAPER NUMBER
2123	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/675,778	LANGEMYR ET AL.	
	Examiner	Art Unit	
	DWIN M. CRAIG	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 January 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-71,75-83,85-87,89-93 and 95-122* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3-71, 75-83, 85-87, 89-93 and 95-122* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1/9/2009, 12/17/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1, 3-71, 75-83, 85-87, 89-93 and 95-122 have been presented for reconsideration based on Applicants' amended claim language and arguments.

Response to Arguments

2. Applicants' arguments presented in the January 12th 2009 response have been fully considered; the Examiner's response is as follows:

2.1 The Examiner thanks the Applicants' for submitting replacement drawings and withdraws the objection to the same.

2.2 As regards Applicants' response to the objections to claims 32 and 33 for minor grammatical informalities, the Examiner thanks the Applicants' for amending claims 32 and 33 and withdraws the earlier applied objections to the same.

2.2 As regards Applicants' response to the 35 U.S.C. 103(a) rejections of the claims, Applicants' argued on page 27 of the January 12th 2009 response in regards to independent claim 1, Applicants' argued;

"Watts **fails** to disclose, teach or suggest producing a model of a combined system by representing physical quantities of the combined system in terms of a combined set of partial differential equations for two or more selected application modes."

The Examiner respectfully traverses Applicants' argument, taking independent claim 1 as an example, the current claim language teaches, *representing at least one of a plurality of physical systems*, at least one is claiming the alternative, meaning a disclosure of *one* physical system meets the call of the claim. As regards the teaching of *two or more physical systems* there is no requirement for *Watts* to disclose a *plurality of physical* systems because this limitation is

being claimed in the alternative and as long as Watts teaches *at least* one <Applicants' claim language> *physical* system then *Watts* has met the call of the claim. Clearly *Watts* teaches the *at least one of a plurality of physical systems* see the Office Action dated November 10th 2009. As regards a teaching of *two or more selected modes* see the discussion set forth below.

On page 27 Applicants' further argued as regards independent claim 1:

"In addition, the Office action states that the term "application modes" as recited in independent claim 1, 42, 82, 92, 116, 117, 119, 121, and 122 is interpreted to mean "different types of phenomena [that] can be modeled using the claimed partial differential equations. (See Office action, p. 6). That is, the Office action appears to be saying that the term "application mode" is analogous to the areas of application (e.g., momentum transport, energy transport) disclosed in Watts. However, this interpretation is inconsistent with the Applicants' specification."

The Examiner respectfully traverses Applicants' argument, the specification in Figure 3 item 32 clearly teaches that the different modes correspond to different physical phenomena, more specifically, AC Power Electromagnetics, Conductive Media DC, Diffusion, Electrostatics, Magnetostatics, Heat transfer, Incompressible Navier-Stokes, Structural Mech. Plane Stress, Structural Mech,. Plane Strain, PDE (Partial Differential Equation) coefficient form, PDE (Partial Differential Equation) general form in comparison to the teachings of Watts which discloses, Col. 4 lines 38-42 of *Watts* more specifically and as disclosed in the Office Action dated 10 October 2009 "…in a broad sense to include momentum transport (viscous flow), energy transport (heat conduction, convection, and radiation), and mass transport (diffusion)..." note the listing of diffusion, which is listed in Applicants' specification in Figure 3 item 32 as one of the *modes* and see also in the disclosure from *Watts* and the listing of heat conduction,

convention and radiation, which is the same as the Heat Transfer mode listed in Figure 3 item 32 of Applicants' specification. Therefore the Examiner is confused as to how the Applicants' argument regarding *Watts* not teaching the claimed *application modes* is valid, when *Watts* clearly teaches at least two of those exact same modes as disclosed in Applicants' specification.

After careful analysis of Applicants' argument regarding *Watts* the Examiner further observed that the second reference *Sagawa et al.* also teaches some of the *application modes* as disclosed in claim 1. More specifically Applicants' specification discloses that *Navier-Stokes* methods of mathematically modeling physical phenomena as one of the *application modes* and in Figure 14 items 5012 & 5011 are disclosed *Navier-Stokes Equation Groups* just like Applicants' *application modes*. Therefore in view of Applicants' claimed *application modes* being disclosed in both the *Watts* and *Sagawa et al.* references the Examiner cannot see how Applicants' claim language in independent claims 1, 42, 82, 116, 117, 119, 121 and 122 disclose any teaching that is novel in view of the disclosed teachings of *Watts* and *Sagawa et al.*

On page(s) 27 & 28 of the of the January 12th 2009 response Applicants' further argued… "Watt's disclosure appears limited to a single physical system." and "Thus Watts fails to disclose, teach or suggest a model of a combined physical system based on the combined set of partial differential equations for two or more application modes for one of a plurality of systems as generally recited in amended claim 1".

The Examiner respectfully traverses Applicants' arguments, *Watts* teaches *at least one physical system* which meets the call of Applicants' claim and further *Watts* teaches simulating a *plurality of modes* as presented in section **7.1** of the Office Action dated November 10th 2009.

2.3 On page 28 of the January 12th 2009 response Applicants' further argued…in regards to dependent claims 3-41 and 102-110, that *Watts* fails to teach *a combined set of partial*

differential equations using a coefficient form of the combined set of partial differential equations.

The Examiner respectfully traverses Applicants' argument, in the Office Action in section **7.10** is disclosed that *Watts* clearly teaches that Col. 7 lines 38-51 "…the algebraic equations will have different forms depending on the solution technique chosen…" therefore *Watts* suggests that different forms of the equation can be created which suggests the claimed *coefficient form* as expressly claimed. Further the Examiner was unable to find a specific definition in Applicants' specification of *coefficient form* of *partial differential equations* and therefore by using a reasonable interpretation of the term *coefficient form* the teaching of different *algebraic equations* that have *different forms* clearly suggests the equations being in a *coefficient form*.

On page 28 of the January 12th 2009 response Applicants' further argued that the teachings of *Sagawa* fails to teach or disclose a user-defined application mode. The Examiner respectfully traverses Applicants' arguments. It would be obvious to an artisan of ordinary skill to allow a user to define the application mode of using a differential equation, or any other type of equation because of the need to use equations to model and calculate real-world phenomena which when this phenomena takes different forms will result in the partial differential equation taking a different form.

2.5 On page 29 of the January 12th 2009 response Applicants' further argued, as regards independent claim 42, substantially the same arguments as set forth for claim 1, therefore the Examiner points to the response as presented above in response to the arguments for claim 42. For example, Applicants' are arguing that *Watts* fails to teach or suggest *a plurality of systems* and further that *Watts* fails to teach *two or more selected application modes*. As set forth in the

response to the arguments regarding claim 1, *Watts* is not required to teach *a plurality of systems* only *at least one of a plurality of systems* and therefore *Watts* meets the call of this claim limitation, further in regards to *Watts* teaches *two or more selected application modes* see the argument above wherein *Watt* teaches at least 2 application modes, in this case *diffusion* and *Heat transfer mode*. See the discussion as presented above.

2.6 On page 30 of the January 12th 2009 response Applicants' further argued in regards to claims 43-71, 75-81, 111 and 112 that;

"…However, Watts in view of Sagawa does not disclose defining a user-defined application mode, as recited, for example in claims 71 and 75…"

The Examiner respectfully traverses Applicants' argument, *Sagawa et al.* clearly teaches that different models, *which provide a user-defined application mode* in other words *model* different physical phenomena, which is functionally the same as Applicants' are claiming, is disclosed in Figure 7 item 24 and Figure 8, note the descriptive text in Figure 8, (HEAT) and PHYSICAL PHENOMENON (COPPER) which clearly teaches a user selecting at least two application modes, see also Figures 21-24 and Col. 5 lines 1-8 which shows that this is an interface, or user interface to input at least two application modes, further as regards a user interface to select applications modes, see Col. 22 lines 14-31 and see Figure 7 which shows an interface for inputting different applications modes and as regards the teaching of object models as disclosed in claim 85 as an example of an object class *Sagawa et al.* teaches Col. 13 lines 48-68 and Col. 14 lines 1-21.

2.7 On pages 30 & 31 of the January 12th 2009 response Applicants' further argued in regards to claim 82 that;

Watts fails to teach or disclose, a combination of the determined set of partial differential equations for the two or more selected user-defined application modes.

The Examiner respectfully traverses Applicants argument, *Watts* clearly teaches a plurality of Partial Differential Equations or (PDE), see Col. 1 lines 15-63 and Col. 2 lines 2-7 and further teaches at least two user-defined application modes, see the specification in Figure 3 item 32 clearly teaches that the different modes correspond to different physical phenomena, more specifically, AC Power Electromagnetics, Conductive Media DC, Diffusion, Electrostatics, Magnetostatics, Heat transfer, Incompressible Navier-Stokes, Structural Mech. Plane Stress, Structural Mech,. Plane Strain, PDE (Partial Differential Equation) coefficient form, PDE (Partial Differential Equation) general form in comparison to the teachings of Watts which discloses, Col. 4 lines 38-42 of *Watts* more specifically and as disclosed in the Office Action dated 10 October 2009 "…in a broad sense to include momentum transport (viscous flow), energy transport (heat conduction, convection, and radiation), and mass transport (diffusion)..." note the listing of diffusion, which is listed in Applicants' specification in Figure 3 item 32 as one of the *modes* and see also in the disclosure from *Watts* and the listing of heat conduction, convention and radiation, which is the same as the Heat Transfer mode listed in Figure 3 item 32 of Applicants' specification. Therefore the Examiner is confused as to how the Applicants' argument regarding *Watts* not teaching the claimed *application modes* is valid, when *Watts* clearly teaches at least two of those exact same modes as disclosed in Applicants' specification.

As regards the limitation of the application modes being user defined the Examiner notes that *Sagawa et al.* was relied upon to teach a *user defined application mode*, *Sagawa et al.* clearly teaches that different models, *which provide a user-defined application mode* in other words *model* different physical phenomena, which is functionally the same as Applicants' are

claiming, is disclosed in Figure 7 item 24 and Figure 8, note the descriptive text in Figure 8, (HEAT) and PHYSICAL PHENOMENON (COPPER) which clearly teaches a user selecting at least two application modes, see also Figures 21-24 and Col. 5 lines 1-8 which shows that this is an interface, or user interface to input at least two application modes, further as regards a user interface to select applications modes, see Col. 22 lines 14-31 and see Figure 7 which shows an interface for inputting different applications modes.

2.8 On page 31 of the January 12th 2009 response Applicants' further argued in regards to claims 83, 85-87, 89-91 and 113 that that neither *Watts* nor *Sagawa* teach all of the claimed elements in claim 81. The Examiner respectfully traverses Applicants' arguments for the reasons set forth above.

On pages 31-37 Applicants' have argued essentially the same arguments regarding claims 92, 93, 95-101, 114, 115, 116, 117, 118, 119, 120, 121 and 122, as were presented for the previously argued claims, see above. The Examiner respectfully traverses Applicants' arguments for the same reasons already presented in this response to arguments.

2.9 More specifically on page 31 Applicants' argued that neither *Watts* nor *Sagawa* teach or suggest all of the limitations as expressly disclosed in dependent claims 83, 85-87, 89-91 and 113, more specifically that because independent claim 82 is allowable the claims that depend from claim 82 are allowable. The Examiner respectfully traverses Applicants' arguments as regards claim 82, see section 2.7 of this Office Action.

2.10 On pages 31 & 32 Applicants' argued that neither *Watts* nor *Sagawa* teach or suggest all of the claimed limitations as disclosed in claim 92, the Examiner respectfully traverses those arguments for those reasons set forth above in sections 2.2 and as regards a response to the argument that neither *Watts* nor *Sagawa* teach or suggest, "*a model of a combined physical*

system in terms of a combined set of partial differential equations and two or more user-defined application modes". The Examiner respectfully traverses Applicants' arguments. *Sagawa* teaches user defined application modes of modeling physical quantities of an associated model, see Figure 7 item 24 and Figure 8, note the descriptive text in Figure 8, (HEAT) and PHYSICAL PHENOMENON (COPPER) which clearly teaches a user selecting at least two application modes, see also Figures 21-24 and Col. 5 lines 1-8 which shows that this is an interface, or user interface to input at least two application modes, further as regards a user interface to select applications modes, see Col. 22 lines 14-31 and see Figure 7 which shows an interface for inputting different applications modes. As regards a teaching that the user modes are *user defined* see Figure 7 item 27 where information is input to the model generation process as disclosed in items 10, note the text "GENERATE PHYSICAL MODEL" see also Figure 26 where the different OBJECTS are generated modeling the physical system, based on the USER input from item 10 in Figure 7, further see Figure 24 which clearly teaches a USER interface for *defining* the application *modes,* in this case Adiabatic, Fixed Temp, Fixed Flux or Heat Outlet. Further and in regards to the teaching of at least two *application modes* as expressly claimed, the Examiner notes that in Figure 26 of *Sagawa* is listed 4 *application modes,* Heat, Fluid, Magnetic and Structure.

2.11 On page 33 Applicants' argued that dependent claims 93, 95-101, 114 and 115 are allowable because they depend from independent claim 92 which Applicants' have argued is in condition for allowance. The Examiner respectfully traverses this argument in view of the arguments set forth in paragraph 2.10 in this Office Action.

2.12 On pages 33 & 34 of the January 12th 2009 response Applicants' further argued as regards independent claim 118 that neither *Watts* nor *Sagawa* teach or disclose, *a model of*

combined system forming a combined set of partial differential equations and a plurality of application modes. The Examiner respectfully traverses Applicants' argument.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Sagawa was relied upon to teach, *a model of combined system forming a combined set of partial differential equations and a plurality of application modes*. The term combined is being interpreted to mean a system that has combined attributes, like the model of the physical system disclosed in *Sagawa,* see the teaching of user defined application modes of modeling physical quantities of an associated model, Figure 7 item 24 and Figure 8, note the descriptive text in Figure 8, (HEAT) and PHYSICAL PHENOMENON (COPPER) which clearly teaches a *combined model with at least two application modes*, see also Figures 21-24 and Col. 5 lines 1-8 which shows that this is an interface, or user interface to input at least two application modes, further as regards a user interface to select applications modes, see Col. 22 lines 14-31 and see Figure 7 which shows an interface for inputting different applications modes. As regards a teaching that the user modes are *user defined* see Figure 7 item 27 where information is input to the model generation process as disclosed in items 10, note the text "GENERATE PHYSICAL MODEL" see also Figure 26 where the different OBJECTS are generated modeling the physical system, based on the USER input from item 10 in Figure 7, further see Figure 24 which clearly teaches a USER interface for *defining* the application *modes,* in this case Adiabatic, Fixed Temp, Fixed Flux or Heat Outlet. Further and in regards to the teaching of at least two *application modes* as expressly claimed, the Examiner notes that in Figure 26 of *Sagawa* is listed 4

application modes, Heat, Fluid, Magnetic and Structure. As regards the teaching of use PDE's or Partial Differential Equations, see the Title of *Sagawa* "METHOD OF GENERATING PARTIAL DIFFERENTIAL EQUATIONS FOR SIMULATION, SIMULATION METHOD, AND METHOD OF GENERATING SIMULATION PROGRAMS". Further *Watts* also teaches a *combined system* in that a combined system is a system with more than one physical phenomena, such as thermal and electrical properties, as argued from claim 1, see the discussion in section 2.2 of this Office Action.

2.13 On page 34 Applicants' further argued that dependent claims 119 & 120 are allowable for at least the reason that they depend from claim 118 which Applicants' arguments is in condition for allowance. The Examiner respectfully traverses Applicants' arguments for the reasons set forth above because claim 118 is not in condition for allowance.

2.14 On pages 35 & 36 Applicants' have repeated the same arguments as regards independent claims 121 & 122 as were presented for independent claim 118. The Examiner respectfully traverses these arguments for the reasons set forth in section 2.12 of this Office Action.

2.15 The Examiner maintains the previous grounds of rejection as set forth in the Non-Final Office Action dated 10 October 2008 for the reasons set forth.

2.16 As regards the IDS submitted on 1/12/2009 and the disclosure of the Notice of Allowance of said Application number 09/995,222. The Examiner notes that Applicants' have claimed *a non-local coupling* in the independent claims of case S/N 09/995,222 now U.S. Patent 7,519,518. The Examiner further notes that the instant claims of this case fail to disclose or suggest *a non-local coupling* and therefore the instant claims, as presented, are patentably distinct from the claim as set forth in U.S. Application 09/995,222. For these reasons an Obviousness type Double Patenting Rejection has not been made in this Office Action with U.S. Patent 7,519,518,

however, if Applicants' were to amend the instant claims to include a teaching of *a local non-coupling* the Examiner would be required to assert an Obviousness type Double Patenting Rejection of the claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1, 3-71, 75-83, 85-87, 89-93 and 95-122 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,810,370 to Watts in view of U.S. Patent 5,408,638 to Sagawa.

3.1 As regards independent claims 1, 42, 82, 92, 116, 117, 119, 121 and 122 and using independent claim 1 as an example, *a method executed in a computer system with at least one physical computing device for producing a model of a combined physical system having physical quantities by representing physical quantities of said combined physical system* (*Watts* teaches a *physical system* see Figures 1-9 and the descriptive text more specifically, Col. 4 lines 28-45 more specifically, "The present invention provides a new method for simulating a *physical system* which is numerically represented by *partial differential equations*" *emphasis added*) *in terms of a combined set of partial differential equations* (Col. 1 lines 15-63 and as regards the teaching of *nonlinear partial differential equations* as described in Applicants' specification on page 16 see Col. 2 lines 2-7 more specifically, "…the equations that model the reservoir are nonlinear partial differential equations…"), *said method comprising;*

representing at least one of a plurality of physical systems as two or more selected application modes modeling physical quantities of said at least one of said plurality of physical systems, wherein said application modes are configured to model the physical quantities for at least one of structural mechanics properties, fluid dynamic properties, electromagnetic properties, chemical reaction properties, acoustic properties and heat transfer properties of said physical system,(*Watts* clearly teaches a plurality of Partial Differential Equations or (PDE), see Col. 1 lines 15-63 and Col. 2 lines 2-7 and further teaches at least two user-defined application modes, see the specification in Figure 3 item 32 clearly teaches that the different modes correspond to different physical phenomena, more specifically, AC Power Electromagnetics,

Conductive Media DC, Diffusion, Electrostatics, Magnetostatics, Heat transfer, Incompressible Navier-Stokes, Structural Mech. Plane Stress, Structural Mech,. Plane Strain, PDE (Partial Differential Equation) coefficient form, PDE (Partial Differential Equation) general form in comparison to the teachings of Watts which discloses, Col. 4 lines 38-42 of *Watts* more specifically "…in a broad sense to include momentum transport (viscous flow), energy transport (heat conduction, convection, and radiation), and mass transport (diffusion)..." note the listing of diffusion, which is listed in Applicants' specification in Figure 3 item 32 as one of the *modes* and see also in the disclosure from *Watts* and the listing of heat conduction, convention and radiation, which is the same as the Heat Transfer mode listed in Figure 3 item 32 of Applicants' specification.)*;*

Claim Interpretation, the Examiner is interpreting the claimed *application modes,* to mean different types of phenomena can be modeled using the claimed *partial differential equations,* see Figure 3 item 32 of Applicants' specification, which teaches various physical phenomena that can be modeled using the partial differential equations.

Watts teaches *selected application modes of physical quantities of a physical system* (see Col. 4 lines 38-42 more specifically, "in a broad sense to include momentum transport (viscous flow), energy transport (heat conduction, convection, and radiation), and mass transport (diffusion). The present invention can be applied to widely different areas such as physics, rock characterization, crystallography, electrical engineering, biology, mathematics, fluid mechanics, and petroleum engineering…" see also Col. 5 lines 9-47).

using a first physical computing device, determining a set of partial differential equations for each of said two or more selected application modes, parameters of said partial differential equations being physical quantities of corresponding ones of said plurality of physical systems;

using said first physical computing device or a second physical computing device, forming said combined set of partial differential equations using determined sets of partial differential equations associated with said one of said plurality of physical systems; and

However, Watts does not expressly disclose, *outputting to a display device or a communication device said model of said combined physical system based on said combined set of partial differential equations for the two or more selected application modes for said one of said plurality of physical systems, whereby said model represents a mathematical expression of said physical quantities of said combined physical system* nor the *application modes being user defined*.

Sagawa teaches *outputting to a display device a model of a physical system based on a set of partial differential equations* (as to a teaching of differential equations see Col. 1 lines 26-46 as to a teaching of displaying a model using differential equations see Col. 21 lines 42-48 more specifically, "A user can observe the graphic display of the results via the interface **17**." See also Figures 22-24 and as regards a teaching of a physical system model being displayed and manipulated see Col. 9 lines 28-67 and Col. 10 lines 1-61) and *Sagawa* teaches the use of two computer apparatus, see Col. 8 lines 14-16. *Sagawa* further teaches user defined application modes of modeling physical quantities of an associated model, see Figure 7 item 24 and Figure 8, note the descriptive text in Figure 8, (HEAT) and PHYSICAL PHENOMENON (COPPER) which clearly teaches a user selecting at least two application modes, see also Figures 21-24 and Col. 5 lines 1-8 which shows that this is an interface, or user interface to input at least two application modes, further as regards a user interface to select applications modes, see Col. 22 lines 14-31 and see Figure 7 which shows an interface for inputting different applications modes. As regards a teaching that the user modes are *user defined* see Figure 7 item 27 where

information is input to the model generation process as disclosed in items 10, note the text "GENERATE PHYSICAL MODEL" see also Figure 26 where the different OBJECTS are generated modeling the physical system, based on the USER input from item 10 in Figure 7, further see Figure 24 which clearly teaches a USER interface for *defining* the application *modes,* in this case Adiabatic, Fixed Temp, Fixed Flux or Heat Outlet.

As regards the limitation of the application modes being user defined *Sagawa et al.* teaches a *user defined application mode*, *Sagawa et al.* clearly teaches that different models, *which provide a user-defined application mode* in other words *model* different physical phenomena, which is functionally the same as Applicants' are claiming, is disclosed in Figure 7 item 24 and Figure 8, note the descriptive text in Figure 8, (HEAT) and PHYSICAL PHENOMENON (COPPER) which clearly teaches a user selecting at least two application modes, see also Figures 21-24 and Col. 5 lines 1-8 which shows that this is an interface, or user interface to input at least two application modes, further as regards a user interface to select applications modes, see Col. 22 lines 14-31 and see Figure 7 which shows an interface for inputting different applications modes. Further and in regards to the teaching of at least two *application modes* as expressly claimed, the Examiner notes that in Figure 26 of *Sagawa* is listed 4 *application modes,* Heat, Fluid, Magnetic and Structure.

Watts and *Sagawa* are analogous art because they both come from the same problem solving area of modeling physical systems using partial differential equations using a computing device.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to have *displayed a model of a physical system using a computing device.*

The motivation for doing so would have been to provide an easy to use method of performing a numerical simulation that require little or no training in order to obtain a useful simulation result, see Col. 3 lines 25-40 as well as Col. 22 lines 24-39 of *Sagawa*.

Therefore, it would have been obvious to combine the teachings of *Sagawa* with the teachings of *Watts* in order to obtain the invention as specified in claims 1, 3-71, 75-83, 85-87, 89-93 and 95-122.

3.2 As regards the dependent claims that depend from independent claim 1, more specifically claims 2-34, 102-110, see the following;

3.3 As regards claims 3, 4 and 5 and using dependent claim 3 as an example, *Watts* teaches or discloses the same functionality of *representing at least one of said physical quantities of a first of said plurality of application nodes using at least one dependent variable in said set of partial differential equations corresponding to said first of said plurality of application modes,* (see Col. 7 lines 38-51).

3.4 As regards claim 6, *Watts* teaches a *numerical value and a mathematical expression* (Col. 16 & 17 tables 1 & 2 and teaches numerical values and Col. 5 lines 9-47 teach *mathematical expressions*).

3.5 As regards claim 7, *Watts* teaches a *time coordinate* "time-step" (Col. 6 lines 57-67 and Col. 7 lines 1-6) *Watts* teaches physical quantities as well see Col. 1 lines 15-26.

3.6 As regards claim 8, 9 and 10 and using claim 8 as an example, *Watts* does not expressly teach a *subdomain with each application mode* however, *Sagawa* teaches Figures 7, 9 & 10 and the descriptive text see also Figures 21-23.

3.7 As regards claim 11, *Watts* teaches *boundary conditions* and so does *Sagawa* see Figure 8 item 244 "Boundary Condition Class" and further see Figure 8 item 118, "BOUNDARY

CONDITION" also see *Watts* Figures 8 & 9 and the descriptive text and see also Col. 5 lines 3-9 and Col. 6 lines 4-13 more specifically, "In this patent the term *boundary* is sometimes used interchangeably with the term connection" *emphasis added*.

3.8 As regards claim 12, *Watts* teaches coefficients however, Watts does not expressly disclose *modifying* coefficients, Sagawa teaches modifying *at least one coefficient of said partial differential equation*, (Figure 39 item 3906 and more specifically, Col. 13 lines 4-45 more specifically, "…calculating a compressibility coefficient…" calculating is functionally the same as *modifying*).

3.9 As regards claims 13 and 14 and using claim 14 as an example, *Watts* does not expressly disclose a GUI, however, *Sagawa* teaches the use of a GUI, see Figures 21-23 and the descriptive text.

3.10 As regards claims 15-25 which are directed towards various methods of solving partial differential equations and more specifically and in regards to claims 16 and 17 and converting equations to various forms in order to solve such equations, this would be well known to an artisan of ordinary skill to convert equations into various forms and further *Watts* teaches modification of the equations using an additive correction or LSOR as disclosed in Col. 12 lines 5-24, which clearly teaches *solving said combined system of partial differential equations using a coefficient form of said set of partial differential equations* the Examiner further notes that when the iterative process as disclosed in *Watts* performs *summing the residuals over the cells of each string,* that this a functionally the same as a *combining system.* Further, and in regards to claim 16, *Watts* clearly teaches that the equations are, *using a general form of said combined system of partial differential equations* (see Col. 7 lines 38-51 more specifically, "…In the process of linearization, the algebraic equations will have different *forms* depending on the

solution technique chosen...", *emphasis added*). As regards claims 17 and 18, see the description above of the teaching in *Watts* as regards *converting at least one set of partial differential equations included in said combined set of partial differential equations from coefficient to general form,* and as regards claims 19 & 20 and the teaching of a *nonlinear set of partial differential equations,* see Col. 2 lines 2-7 of *Watts,* further and in regards to using a Newton method see Col. 2 lines 21-52, more specifically "…One example is the well-known Newton-Raphson method…", as regards claims 22-25 are directed to various methods of using *solving, Watts* teaches solving, see the rejections above, further and in regards to claim 25, *Watts* teaches a *finite element method* see Col. 1 lines 42-63 more specifically, "…As a means for numerically solving such equations there are known the *finite element method*, the finite difference method, the finite volume method and the like…" *emphasis added*.

3.11 As regards claim 26, *Watts* does not expressly disclose, *using a graphical user interface in connection with input data; storing said input data in a representation in a data structure stored in a memory of said first physical computing device or said second physical computing device; and converting said input into an intermediate form wherein said intermediate form for each partial differential equations associated with said one of said plurality of physical systems is used in forming said combined set,* however, *Sagawa* teaches, Figures 21-24 and the descriptive text, more specifically, (Col. 5 lines 1-9 and Col. 9 lines 26-68 and Col. 10 lines 1-61).

3.12 As regards claim 27, *Watts* teaches, *determining a submode setting associated with one or the sets of partial differential equations associated with said one of said plurality of systems; and determining a number of variables included in said one set of partial differential equations*

in accordance with said submode setting and a type of a corresponding application mode (Col. 1 lines 16-55 and Col. 2 lines 1-24 and Col. 5 lines 9-47 and Col. 6 lines 7-31).

3.13 As regards claim 28 *Watts* teaches, *wherein said submode is one of stationary, time dependent, linear, non-linear, scalar and multi-component* (see Figures 1-9 and as regards *time dependent* see Col. 7 lines 52-58, "…time-step…", as regards *linear* see Col. 7 lines 62-66, "…suitable linear equations…", as regards *scalar*, which is being interpreted to be the computation of residuals for the strings see Col. 12 line 51 as regards multiple component see Figures 1-9 as regards multiple components).

3.14 As regards claim 29, *Watts* does not expressly teach *selecting at least one application mode,* however, *Sagawa* teaches processing input including an *application mode,* (see Figures 21-24 and the descriptive text).

3.15 As regards claim 30, *Watts* teaches *wherein said at least one application mode* (see Col. 12 lines 61-65) however, *Watts* does not expressly disclose, is *one of predefined and user defined*. *Sagawa* teaches, using predefined and user defined application modes, see Figure 24 and the descriptive text.

3.16 As regards claim 31, *Watts* does not expressly disclose, *modifying a set of routines associated with a predefined application mode to be used in connection with a user defined application mode,* however, *Sagawa* teaches a collection of predefined object oriented programming *routines* that can be used with a *user defined application mode* see Figure 26 and Figures 20, 7-17 and the descriptive text as regards these figures.

3.17 As regards claims 32-34, *Watts* clearly teaches *wherein said one of said plurality physical systems being modeled is a two-dimensional/three-dimensional system* (see Col. 4 lines 30-33).

3.18 As regards claim 35, *Watts* does not expressly disclose, *defining a user-defined application mode* however, *Sagawa* teaches using a computer interface to enable a *user defined application mode*, see Figure(s) 21-24 and the descriptive text regarding these figures.

3.19 As regards claim 36, *Watts* does not expressly disclose, *defining an object class corresponding to said user-defined application mode; and defining a first portion of methods including in said object class using functionality that is inherited from other classes,* however, *Sagawa* teaches, (Col. 8 lines 45-68 and Col. 9 and Col. 10 lines 1-61 and Figures 8-10).

3.20 As regards claim(s) 37 & 38 and using claim 37 as an example, *Watts* does not expressly disclose *overloading a second portion of methods to provide alternate functionality*, however, *Sagawa* teaches (Col. 8 lines 45-68 and Col. 9 and Col. 10 lines 1-61 and Figures 8-10) and *overloading* would be well known to an artisan of ordinary skill in the Object-Oriented Programming Art.

3.21 As regards claim 39, *Watts* does not expressly disclose, *defining an application that is a subclass of an existing class corresponding to functionality of an application node* however, *Sagawa* teaches a hierarchy of object classes which include *subclasses* as is denoted by their position within the object hierarchy, see Figures 19 & 20 where the Examiner is interpreting items 1004, 1010, 1005, 1006 and 1007 as being members of a *subclass*.

3.22 As regards claims 40, *Watts* does not expressly disclose *wherein said application mode is user configurable* however, *Sagawa* teaches a user interface which is used to configure *application modes* see Figure 2 item 10 "Receive Physical Model from User" and further see Figure(s) 21-24 and the descriptive text as regards Figure(s) 2 and 21-24.

3.23 As regards claim 41, *Watts* teaches that, *said application modes is predefined,* see Col. 5 lines 10-22, more specifically, "…The entity being transported could for example be mass or

volume of fluid, number of particles, thermal energy, radiation or electricity. If the physical system being simulated is a hydrocarbon reservoir, transportability as used in the description of the invention is synonymous with transmissibility…" which is being interpreted to mean that the *application mode* being a *hydrocarbon reservoir* has been *predefined* to have *transportability*.

3.24 As regards newly presented claim 102, *Watts* discloses, *wherein said representation of at least one of said plurality of physical systems as two or more selected application modes modeling physical quantities includes a time dimension,* see the teaching of *time steps* as disclosed in Col. 7 lines 2-51, note the discussion of time-steps.

3.25 As regards claims 103, 104 and 105 *Watts* does not expressly disclose, *storing said output of said model of said combined physical system in a computer readable memory or in a computer readable storage system located within said first physical computing device or said second physical computing device*, however, *Sagawa* teaches the use of two computer apparatus, see Col. 8 lines 14-16 and teaches the storage of information as regards the simulation of the physical structure, see Col. 10 lines 64-68 and Col. 11 lines 1-40.

3.26 As regards claims 106 & 107, *Watts* does not expressly disclose, *storing said output of said model of said combined physical system in a data storage system, said data storage system communicatively connected to said communication device and to a plurality of host computers comprising at least one of said first computing device and said second computing device*, however, *Sagawa* teaches, teaches the use of two computer apparatus, see Col. 8 lines 14-16 and teaches the storage of information as regards the simulation of the physical structure, see Col. 10 lines 64-68 and Col. 11 lines 1-40 and as regards the teaching of the computing devices being *communicatively connected to said communication device* the examiner is interpreting this to mean that two separate computational systems are able to communicate with each other. At the

time of Applicants' invention it would have been within the knowledge of an artisan of ordinary skill to have *coupled* at least two computing units together to perform a simulation task.

3.27 As regards claims 108, 109 & 110, *Watts* does not expressly disclose, *displaying said output of said model of said combined physical system on said display device, wherein said first physical computing device or said second physical computing device comprise said display device* however, *Sagawa* teaches, Figure 2 item 35 as well as Figure 22 and Figure 38 item 3802 and the descriptive text for said figures, as well as Col. 7 starting on line 67, "…the obtained numerical results are displayed via the interface **17…**".

3.28 As regards dependent claims 43-81, 111 & 112 see the rejections as set forth above for dependent claims 2-34, 102-110.

3.29 As regards dependent claims 83-91 and 113 see the rejections as set forth above for dependent claims 2-34, 102-110.

3.30 As regards dependent claims 93, 95-101, 114 and 115 see the rejections as set forth above for dependent claims 2-34, 102-110.

3.31 As regards dependent claims 119 and 120, see the rejections as set forth above for dependent claims 2-34, 102-110.

Conclusion

4. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DWIN M. CRAIG whose telephone number is (571)272-3710. The examiner can normally be reached on 10:00 - 6:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul L. Rodriguez can be reached on (571) 272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Dwin M Craig/
Examiner, Art Unit 2123

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